PATENT ABSTRACTS OF JAPAN

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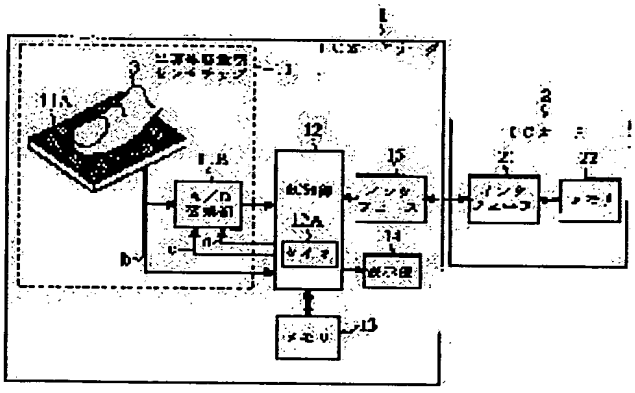
(54) FINGERPRINT COLLATION DEVICE

(57)Abstract:
PROBLEM TO BE SOLVED: To accurately detect a fingerprint image of a person's fingertip having individual differences, such as a dry skin or a fatty skin.
SOLUTION: In this collation device, when an IC card 2 is inserted into an IC card reader 1, the IC card reader 1 reads a waiting time, parameters and fingerprint data specific to the user from the IC card 2, sets the parameters peculiar to the user to an A/D converting part 11B of a sensor chip 11, and sets the waiting time specific to the user to a timer 12A. When a finger 3 of the user is pressed against the sensor chip 11, the timer 12A is started, and the sensor chip 11 is started after a time of the timer 12A is up, to detect a fingerprint of the finger 3. The fingerprint data detected by the sensor chip 11 are collated with the fingerprint data from the IC card 2 to identify the user.



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CLAIMS

[Claim(s)]

[Claim 1] The storage section which keeps the individual humanity news containing the parameter of the capacity mold sensor chip which consists of a semi-conductor which detects a fingerprint, and a user's fingerprint image data and said capacity mold sensor chip, The fingerprint authentication section which collates the fingerprint image data detected with said capacity mold sensor chip, and the fingerprint data of said storage section, The setting section which sets up the parameter of said storage section to said capacity mold sensor chip, It has the control section which this capacity mold sensor chip is started [control section] and makes said fingerprint image data detect after a setup of the parameter to said capacity mold sensor chip by said setting section. Said fingerprint authentication section The fingerprint collation device characterized by collating the fingerprint image detected with this capacity mold sensor chip after starting of said capacity mold sensor chip of said control section, and the fingerprint data of said storage section, and performing fingerprint authentication.

[Claim 2] In claim 1, said storage section keeps the latency time at the time of fingerprint image detection of said capacity mold sensor chip as said individual humanity news. It is the fingerprint collation device which is equipped with the detecting element which detects contact of the finger to said capacity mold sensor chip, and is characterized by for said control section starting said capacity mold sensor chip after latency-time progress of said storage section after contact of a finger is detected by said detecting element, and making detection of said fingerprint image start.

[Claim 3] The fingerprint collation device characterized by preparing IC card reader which reads the data of said IC card, and preparing said capacity mold sensor chip, said fingerprint authentication section, said setting section, said control section, and a detecting element in said IC card reader while preparing said storage section which keeps said individual humanity news in an IC card in claim 1 or claim 2.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the fingerprint collation device which performs collating with the fingerprint data registered beforehand and the fingerprint data detected by the semi-conductor capacity mold sensor.
[0002]
[Description of the Prior Art] The semi-conductor capacity mold sensor used for this kind of fingerprint collation device detects the irregularity of human being's fingerprint as a capacity difference, and generates it as a shade image. Said fingerprint collation device registers a user's fingerprint data beforehand, when attesting a user using a fingerprint. and -- if the fingerprint data which generated fingerprint data and were generated from the detected fingerprint image are compared with said fingerprint data registered and both are in agreement, while making the irregularity of this user's fingerprint detect as a fingerprint image based on the capacity difference of a capacity mold sensor as mentioned above, when a user's finger is stamped on said semi-conductor capacity mold sensor -- a user -- it is recognized as his being him.
[0003]
[Problem(s) to be Solved by the Invention] Generally, human being's fingertip has individual difference like the desiccation skin or the oily skin skin. Since the semi-conductor capacity mold sensor had detected the fingerprint image of the fingertip of human being who has such individual difference on the same conditions regardless of individual difference, the conventional fingerprint collation device had the technical problem that an exact fingerprint image required for collating was not obtained. Therefore, this invention aims at performing exact detection, when detecting the fingerprint image of the fingertip of human being who has individual difference like the desiccation skin or the oily skin skin.
[0004]
[Means for Solving the Problem] The capacity mold sensor chip with which this invention consists of a semi-conductor which detects a fingerprint in order to solve such a technical problem, The storage section which keeps the individual humanity news containing a user's fingerprint image data and the parameter of a capacity mold sensor chip, The fingerprint authentication section which collates the fingerprint image data and the fingerprint data of the storage section which were detected with a capacity mold sensor chip, The setting section which sets up the parameter of said storage section to a capacity mold sensor chip, The control section which this capacity mold sensor chip is started [control section] and makes fingerprint image data detect is prepared after a setup of the parameter to the capacity mold sensor chip by the setting section. The fingerprint authentication section The fingerprint image and the fingerprint data of the storage section which were detected with this capacity mold sensor chip after starting of the capacity mold sensor chip of a control section are collated, and it is made to perform fingerprint authentication. Moreover, the storage section keeps the latency time at the time of fingerprint image detection of a capacity mold sensor chip as individual humanity news, the detecting element which detects contact of the finger to a capacity mold sensor chip is prepared, and after contact of a finger is detected by the detecting element, a control section starts a capacity mold sensor chip, and makes detection of a fingerprint image start after latency-time progress of the storage section. Moreover, while preparing the storage section which keeps individual humanity news in an IC card, a capacity mold sensor chip, the fingerprint authentication section, the setting section, a control section, and a detecting element are prepared in IC card reader which reads the data of an IC card.

[0005]
[Embodiment of the Invention] Hereafter, this invention is explained with reference to a drawing. Drawing 1 is the block diagram showing the configuration of the fingerprint collation device concerning this invention. This fingerprint collation device consists of an IC card reader 1 and IC card 2, as shown in drawing 1 . The IC card reader 1 consists of the semi-conductor capacity mold sensor chip (henceforth, sensor chip) 11 which detects the fingerprint of the finger 3 stamped by the user, the control section 12 which inputs the fingerprint image data detected with the sensor chip 11, and performs predetermined processing, memory 13 which accumulates the fingerprint image data inputted by the control section 12, a display 14 which performs various kinds of displays, and an interface 15 with IC card 2.
[0006] The sensor chip 11 consists of sensor section 11A and A/D-conversion section 11B which the fingerprint image detected by the sensor section 11 is digitized, and is outputted to a control section 12 as fingerprint image data. Moreover, a control section 12 builds in timer 12A. Furthermore, IC card 2 has the interface 21 with the IC card reader 1, and the memory 22 which registers a user's fingerprint image data.
[0007] As mentioned above by A/D-conversion section 11B, the voltage signal which sensor section 11A of the sensor chip 11 which constitutes the IC card reader 1 generated the capacity difference according to the irregularity (namely, fingerprint) of the front face of the skin of the finger 3 which contacted when a user's finger 3 was stamped, outputs it as a voltage signal, and was outputted by sensor section 11A is changed into a digital signal, and is outputted to a control section 11 as fingerprint image data.
[0008] Drawing 2 and drawing 3 are drawings showing the configuration of sensor section 11A in the above-mentioned sensor chip 11. Sensor section 11A consists of two or more sensors 4 arranged in the shape of a grid, as shown in drawing 2 , and the sensor 4 which is one unit sensor consists of the sensing element 41 which is a capacitative element as shown in drawing 3 , a signal generating circuit 42, a signal amplifying circuit 43, and an output circuit 44. And if a finger 3 contacts, the capacity difference according to the irregularity of the front face of the skin of the finger 3 which contacted in the sensing element 41 of each sensor 4, respectively occurs, and it has the composition that the voltage signal according to this capacity difference is amplified by the signal amplifying circuit 43, and is outputted to A/D-conversion section 11B from an output circuit 44.
[0009] Although A/D-conversion section 11B which constitutes the sensor chip 11 changes into digital value the analog voltage level (analog value) outputted from the output circuit 44 of a sensor 4, according to the parameter value set up, the correspondence relation between an analog value and digital value changes. The parameter value A and B as shows the parameter set as A/D-conversion section 11B to drawing 4 is set up.
[0010] Now, if the analog value inputted into A/D-conversion section 11B is the level of under an active-parameter value (A+B), the deep-black fingerprint image of gradation 0 shall be obtained from A/D-conversion section 11B. Moreover, if the analog value inputted into A/D-conversion section 11B is beyond an active-parameter value (A+ (255xB)), the pure white fingerprint image of gradation 255 shall be obtained from A/D-conversion section 11B. furthermore, the analog value inputted into A/D-conversion section 11B -- more than parameter value (A+nxB) -- and if it is the level of under parameter value (A+(n+1) B), the fingerprint image of Gradation n shall be obtained from A/D-conversion section 11B
[0011] Thus, if parameter value A is set as size, the fingerprint image obtained from A/D-conversion section 11B will become black, and if parameter value A is set as smallness, the fingerprint image obtained from A/D-conversion section 11B will become white. Moreover, if parameter value B is set as size, the resolution of the fingerprint image obtained from A/D-conversion section 11B will become coarse, and if parameter value B is set as smallness, the resolution of the fingerprint image obtained from A/D-conversion section 11B will become fine. Thus, the brightness and resolution of a fingerprint image which are obtained from A/D-conversion section 11B are changeable by changing the parameter value of A/D-conversion section 11B. Therefore, when detecting the fingerprint image of the fingertip of human being who has individual difference like the desiccation skin or the oily skin skin, the exact fingerprint image which is not influenced by the above individual difference from A/D-conversion section 11B can be made to output by setting the parameter value according to such individual difference as A/D-conversion section 11B.
[0012] Drawing 5 is a flow chart which shows important section actuation of this fingerprint collation device, and shows reading actuation of the fingerprint by the sensor chip 11. Important section actuation of this invention is explained to a detail according to this flow

chart. By the way, while the fingerprint image data of a user proper is registered into the memory 22 of IC card 2, registration storage of the parameter value A and B of this user proper set as A/D-conversion section 11B in the sensor chip 11 mentioned above and the latency time until A/D-conversion section 11B starts conversion actuation is carried out as a user's individual humanity news.

[0013] If such IC card 2 is inserted in the IC card reader 1 by the user, first, in step S1, the control section 12 of the IC card reader 1 will read a user's fingerprint image data, parameter value, and the latency time in the memory 22 of IC card 2, and will memorize them in memory 13. Next, a control section 12 sets said latency time as timer 12A at step S3 while setting this parameter value as A/D-conversion section 11B through the signal line a shown in drawing 1 R> 1 at step S2.

[0014] Next, if a control section 12 makes a detection judgment through the signal line b which shows drawing 1 whether a user's finger 3 was stamped on sensor section 11A in the sensor chip 11 by step S4 and stamp of a finger 3 is detected, it will start timer 12A at step S5. And if the existence of deadline of timer 12A is judged at step S6 and timer 12A passes the deadline of, A/D-conversion section 11B will be started through the signal line c shown in drawing 1 at step S7.

[0015] Then, a control section 11 reads the fingerprint image data which was detected by sensor section 11A and digitized by A/D-conversion section 11B one by one at step S8, and carries out sequential storage at memory 13. If reading of all fingerprint image data is completed and the judgment of step S9 is set to "Y" Collating processing with the fingerprint image data which read in the sensor chip 11 and was memorized in memory 13, and the fingerprint image data which read in the memory 22 of IC card 2, and was memorized in memory 13 is performed at step S10.

[0016] and -- if a quality judgment about the result of said collating processing is made at step S11, the fingerprint image data read in the sensor chip 11 and the fingerprint image data read in IC card 2 are in agreement and the judgment of step S11 is set to "Y" -- step S12 -- a display 14 -- him of a "he authentication" purport -- it displays by performing a check result output.

[0017] Thus, when detecting the fingerprint image of the fingertip of human beings who have individual difference, such as the desiccation skin and the oily skin skin, the exact fingerprint image which is not influenced by the above individual difference can be made to output from A/D-conversion section 11B by having constituted so that the parameter value according to such individual difference might be set as A/D-conversion section 11B. Furthermore, in case the fingerprint image of the fingertip of human being who has individual difference is detected, the more exact fingerprint image which is not influenced by the above individual difference can be obtained by having set up the detection latency time of the sensor chip 11 according to the above individual difference.

[0018]

[Effect of the Invention] The capacity mold sensor chip which consists of a semi-conductor which detects a fingerprint according to this invention as explained above, The storage section which keeps the individual humanity news containing a user's fingerprint image data and the parameter of a capacity mold sensor chip, The fingerprint authentication section which collates the fingerprint image data and the fingerprint data of the storage section which were detected with a capacity mold sensor chip, Since the setting section which sets up the parameter of the storage section to a capacity mold sensor chip is prepared, this capacity mold sensor chip after a setup of the parameter to the capacity mold sensor chip by the setting section is started and it was made to make fingerprint image data detect When detecting the fingerprint image of the fingertip of human beings who have a difference for every each people, such as the desiccation skin and the oily skin skin Since the parameter according to such individual difference is set as a capacity mold sensor chip, it becomes possible to make the exact fingerprint image which is not influenced by the above individual difference from a capacity mold sensor chip output. Moreover, while the storage section keeps the latency time at the time of fingerprint image detection of a capacity mold sensor chip as individual humanity news Since a capacity mold sensor chip is started and it was made to make detection of a fingerprint image start after latency-time progress of the storage section after it prepared the detecting element which detects contact of the finger to a capacity mold sensor chip and contact of a finger was detected by the detecting element Since the detection latency time of a capacity mold sensor chip is set up according to the above individual difference in case the fingerprint image of the fingertip of human being who has individual difference is detected, it becomes possible to make the more exact fingerprint image which is

not influenced by such individual difference from a capacity mold sensor chip output. Moreover, since a capacity mold sensor chip, the fingerprint authentication section, the setting section, the control section, and the detecting element were prepared in IC card reader which reads the data of an IC card while preparing the storage section which keeps individual humanity news in the IC card, each user can carry out management storage of the own individual humanity news exactly.

[Translation done.]

TECHNICAL FIELD

[Field of the Invention] This invention relates to the fingerprint collation device which performs collating with the fingerprint data registered beforehand and the fingerprint data detected by the semi-conductor capacity mold sensor.

[Translation done.]

PRIOR ART

[Description of the Prior Art] The semi-conductor capacity mold sensor used for this kind of fingerprint collation device detects the irregularity of human being's fingerprint as a capacity difference, and generates it as a shade image. Said fingerprint collation device registers a user's fingerprint data beforehand, when attesting a user using a fingerprint. and -- if the fingerprint data which generated fingerprint data and were generated from the detected fingerprint image are compared with said fingerprint data registered and both are in agreement, while making the irregularity of this user's fingerprint detect as a fingerprint image based on the capacity difference of a capacity mold sensor as mentioned above, when a user's finger is stamped on said semi-conductor capacity mold sensor -- a user -- it is recognized as his being him.
[0003]

[Translation done.]

EFFECT OF THE INVENTION

[Effect of the Invention] The capacity mold sensor chip which consists of a semi-conductor which detects a fingerprint according to this invention as explained above, The storage section which keeps the individual humanity news containing a user's fingerprint image data and the parameter of a capacity mold sensor chip, The fingerprint authentication section which collates the fingerprint image data and the fingerprint data of the storage section which were detected with a capacity mold sensor chip, Since the setting section which sets up the parameter of the storage section to a capacity mold sensor chip is prepared, this capacity mold sensor chip after a setup of the parameter to the capacity mold sensor chip by the setting section is started and it was made to make fingerprint image data detect When detecting the fingerprint image of the fingertip of human beings who have a difference for every each people, such as the desiccation skin and the oily skin skin Since the parameter according to such individual difference is set as a capacity mold sensor chip, it becomes possible to make the exact fingerprint image which is not influenced by the above individual difference from a capacity mold sensor chip output. Moreover, while the storage section keeps the latency time at the time of fingerprint image detection of a capacity mold sensor chip as individual humanity news Since a capacity mold sensor chip is started and it was made to make detection of a fingerprint image start after latency-time progress of the storage section after it prepared the detecting element which detects contact of the finger to a capacity mold sensor chip and contact of a finger was detected by the detecting element Since the detection latency time of a capacity mold sensor chip is set up according to the above individual difference in case the fingerprint image of the fingertip of human being who has individual difference is detected, it becomes possible to make the more exact fingerprint image which is not influenced by such individual difference from a capacity mold sensor chip output. Moreover, since a capacity mold sensor chip, the fingerprint authentication section, the setting section, the control section, and the detecting element were prepared in IC card reader which reads the data of an IC card while preparing the storage section which keeps individual humanity news in the IC card, each user can carry out management storage of the own individual humanity news exactly.

[Translation done.]

MEANS

[Means for Solving the Problem] The capacity mold sensor chip with which this invention consists of a semi-conductor which detects a fingerprint in order to solve such a technical problem, The storage section which keeps the individual humanity news containing a user's fingerprint image data and the parameter of a capacity mold sensor chip, The fingerprint authentication section which collates the fingerprint image data and the fingerprint data of the storage section which were detected with a capacity mold sensor chip, The setting section which sets up the parameter of said storage section to a capacity mold sensor chip, The control section which this capacity mold sensor chip is started [control section] and makes fingerprint image data detect is prepared after a setup of the parameter to the capacity mold sensor chip by the setting section. The fingerprint authentication section The fingerprint image and the fingerprint data of the storage section which were detected with this capacity mold sensor chip after starting of the capacity mold sensor chip of a control section are collated, and it is made to perform fingerprint authentication. Moreover, the storage section keeps the latency time at the time of fingerprint image detection of a capacity mold sensor chip as individual humanity news, the detecting element which detects contact of the finger to a capacity mold sensor chip is prepared, and after contact of a finger is detected by the detecting element, a control section starts a capacity mold sensor chip, and makes detection of a fingerprint image start after latency-time progress of the storage section. Moreover, while preparing the storage section which keeps individual humanity news in an IC card, a capacity mold sensor chip, the fingerprint authentication section, the setting section, a control section, and a detecting element are prepared in IC card reader which reads the data of an IC card.

[0005]

[Embodiment of the Invention] Hereafter, this invention is explained with reference to a drawing. Drawing 1 is the block diagram showing the configuration of the fingerprint collation device concerning this invention. This fingerprint collation device consists of an IC card reader 1 and IC card 2, as shown in drawing 1 . The IC card reader 1 consists of the semi-conductor capacity mold sensor chip (henceforth, sensor chip) 11 which detects the fingerprint of the finger 3 stamped by the user, the control section 12 which inputs the fingerprint image data detected with the sensor chip 11, and performs predetermined processing, memory 13 which accumulates the fingerprint image data inputted by the control section 12, a display 14 which performs various kinds of displays, and an interface 15 with IC card 2.

[0006] The sensor chip 11 consists of sensor section 11A and A/D-conversion section 11B which the fingerprint image detected by the sensor section 11 is digitized, and is outputted to a control section 12 as fingerprint image data. Moreover, a control section 12 builds in timer 12A. Furthermore, IC card 2 has the interface 21 with the IC card reader 1, and the memory 22 which registers a user's fingerprint image data.

[0007] As mentioned above by A/D-conversion section 11B, the voltage signal which sensor section 11A of the sensor chip 11 which constitutes the IC card reader 1 generated the capacity difference according to the irregularity (namely, fingerprint) of the front face of the skin of the finger 3 which contacted when a user's finger 3 was stamped, outputs it as a voltage signal, and was outputted by sensor section 11A is changed into a digital signal, and is outputted to a control section 11 as fingerprint image data.

[0008] Drawing 2 and drawing 3 are drawings showing the configuration of sensor section 11A in the above-mentioned sensor chip 11. Sensor section 11A consists of two or more sensors 4 arranged in the shape of a grid, as shown in drawing 2 , and the sensor 4 which is one unit sensor consists of the sensing element 41 which is a capacitative element as shown in drawing

3 , a signal generating circuit 42, a signal amplifying circuit 43, and an output circuit 44. And if a finger 3 contacts, the capacity difference according to the irregularity of the front face of the skin of the finger 3 which contacted in the sensing element 41 of each sensor 4, respectively occurs, and it has the composition that the voltage signal according to this capacity difference is amplified by the signal amplifying circuit 43, and is outputted to A/D-conversion section 11B from an output circuit 44.

[0009] Although A/D-conversion section 11B which constitutes the sensor chip 11 changes into digital value the analog voltage level (analog value) outputted from the output circuit 44 of a sensor 4, according to the parameter value set up, the correspondence relation between an analog value and digital value changes. The parameter value A and B as shows the parameter set as A/D-conversion section 11B to drawing 4 is set up.

[0010] Now, if the analog value inputted into A/D-conversion section 11B is the level of under an active-parameter value (A+B), the deep-black fingerprint image of gradation 0 shall be obtained from A/D-conversion section 11B. Moreover, if the analog value inputted into A/D-conversion section 11B is beyond an active-parameter value (A+ (255xB)), the pure white fingerprint image of gradation 255 shall be obtained from A/D-conversion section 11B. furthermore, the analog value inputted into A/D-conversion section 11B -- more than parameter value (A+nxB) -- and if it is the level of under parameter value (A+(n+1) B), the fingerprint image of Gradation n shall be obtained from A/D-conversion section 11B

[0011] Thus, if parameter value A is set as size, the fingerprint image obtained from A/D-conversion section 11B will become black, and if parameter value A is set as smallness, the fingerprint image obtained from A/D-conversion section 11B will become white. Moreover, if parameter value B is set as size, the resolution of the fingerprint image obtained from A/D-conversion section 11B will become coarse, and if parameter value B is set as smallness, the resolution of the fingerprint image obtained from A/D-conversion section 11B will become fine. Thus, the brightness and resolution of a fingerprint image which are obtained from A/D-conversion section 11B are changeable by changing the parameter value of A/D-conversion section 11B. Therefore, when detecting the fingerprint image of the fingertip of human being who has individual difference like the desiccation skin or the oily skin skin, the exact fingerprint image which is not influenced by the above individual difference from A/D-conversion section 11B can be made to output by setting the parameter value according to such individual difference as A/D-conversion section 11B.

[0012] Drawing 5 is a flow chart which shows important section actuation of this fingerprint collation device, and shows reading actuation of the fingerprint by the sensor chip 11. Important section actuation of this invention is explained to a detail according to this flow chart. By the way, while the fingerprint image data of a user proper is registered into the memory 22 of IC card 2, registration storage of the parameter value A and B of this user proper set as A/D-conversion section 11B in the sensor chip 11 mentioned above and the latency time until A/D-conversion section 11B starts conversion actuation is carried out as a user's individual humanity news.

[0013] If such IC card 2 is inserted in the IC card reader 1 by the user, first, in step S1, the control section 12 of the IC card reader 1 will read a user's fingerprint image data, parameter value, and the latency time in the memory 22 of IC card 2, and will memorize them in memory 13. Next, a control section 12 sets said latency time as timer 12A at step S3 while setting this parameter value as A/D-conversion section 11B through the signal line a shown in drawing 1 R> 1 at step S2.

[0014] Next, if a control section 12 makes a detection judgment through the signal line b which shows drawing 1 whether a user's finger 3 was stamped on sensor section 11A in the sensor chip 11 by step S4 and stamp of a finger 3 is detected, it will start timer 12A at step S5. And if the existence of deadline of timer 12A is judged at step S6 and timer 12A passes the deadline of, A/D-conversion section 11B will be started through the signal line c shown in drawing 1 at step S7.

[0015] Then, a control section 11 reads the fingerprint image data which was detected by sensor section 11A and digitized by A/D-conversion section 11B one by one at step S8, and carries out sequential storage at memory 13. If reading of all fingerprint image data is completed and the judgment of step S9 is set to "Y" Collating processing with the fingerprint image data which read in the sensor chip 11 and was memorized in memory 13, and the fingerprint image data which read in the memory 22 of IC card 2, and was memorized in memory 13 is performed at step S10.

[0016] and -- if a quality judgment about the result of said collating processing is made at step S11, the fingerprint image data read in the sensor chip 11 and the fingerprint image data

read in IC card 2 are in agreement and the judgment of step S11 is set to "Y" -- step S12 -- a display 14 -- him of a "he authentication" purport -- it displays by performing a check result output.

[0017] Thus, when detecting the fingerprint image of the fingertip of human beings who have individual difference, such as the desiccation skin and the oily skin skin, the exact fingerprint image which is not influenced by the above individual difference can be made to output from A/D-conversion section 11B by having constituted so that the parameter value according to such individual difference might be set as A/D-conversion section 11B. Furthermore, in case the fingerprint image of the fingertip of human being who has individual difference is detected, the more exact fingerprint image which is not influenced by the above individual difference can be obtained by having set up the detection latency time of the sensor chip 11 according to the above individual difference.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the block diagram showing the configuration of the fingerprint collation device concerning this invention.

[Drawing 2] It is drawing showing the configuration of the fingerprint sensor section in the semi-conductor capacity mold sensor chip of said fingerprint collation device.

[Drawing 3] It is the block diagram showing the configuration of one detection unit in said semi-conductor capacity mold sensor chip.

[Drawing 4] It is drawing showing the situation of the parameter set as the A/D-conversion section in said semi-conductor capacity mold sensor chip.

[Drawing 5] It is the flow chart which shows important section actuation of a fingerprint collation device.

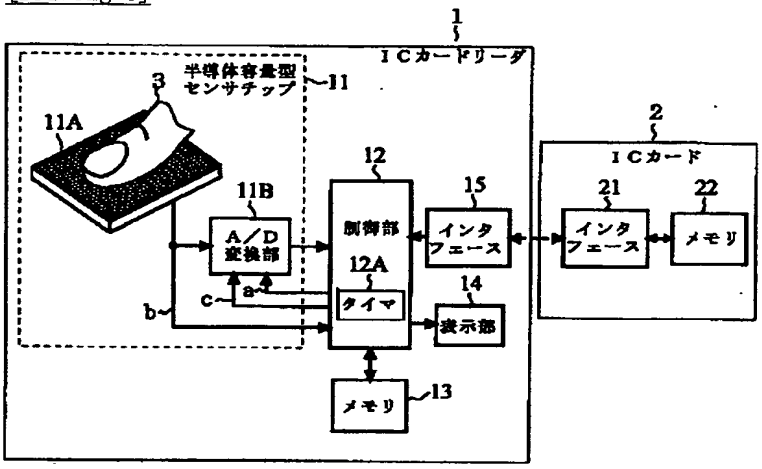
[Description of Notations]

1 [-- A sensor, 11 / -- A semi-conductor capacity mold sensor 11A / -- The sensor section, 11 B--A/D transducer, 12 / -- A control section, 12A / -- 13 A timer, 22 / -- Memory, 14 / -- 15 A display, 21 / -- An interface, 41 / -- A sensing element, 42 / -- A signal generating circuit, 43 / -- A signal amplifying circuit, 44 / -- Output circuit.] -- IC card reader, 2 -- An IC card, 3 -- A finger, 4

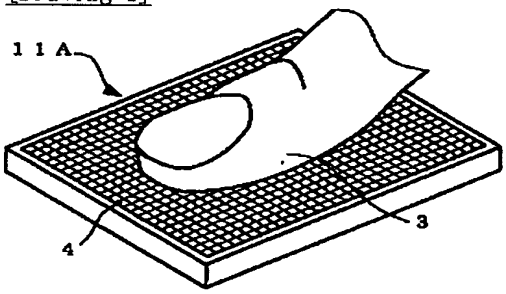
[Translation done.]

DRAWINGS

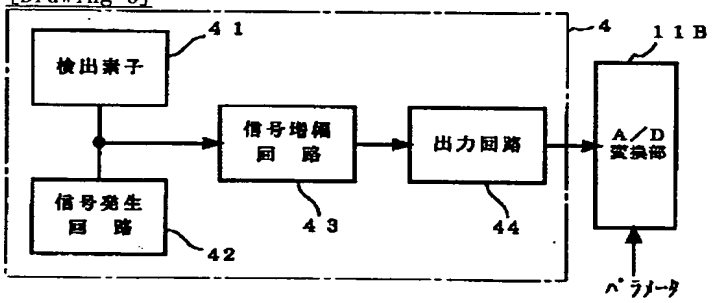
[Drawing 1]



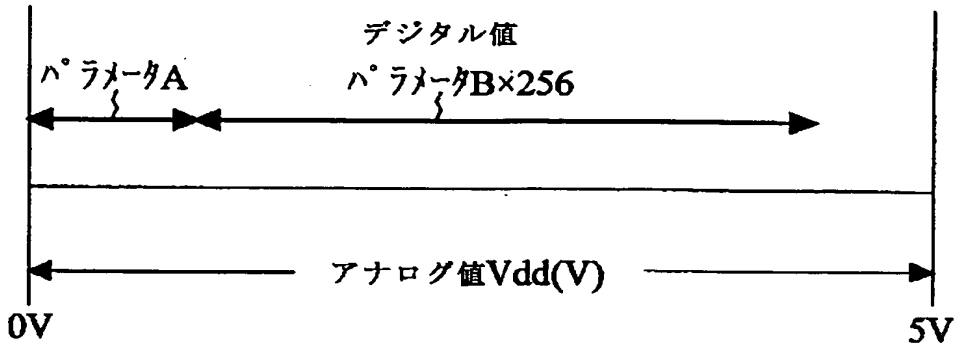
[Drawing 2]



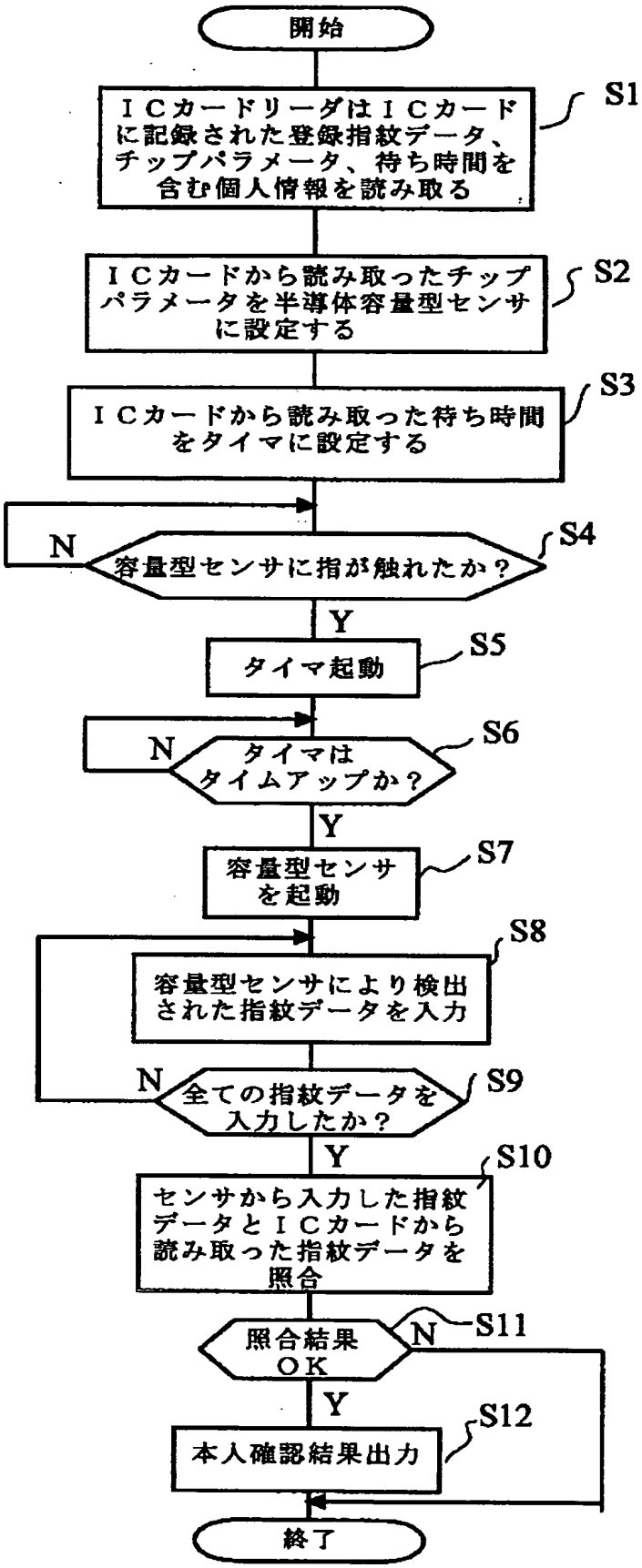
[Drawing 3]



[Drawing 4]



[Drawing 5]


開始
ＩＣカードリーダはＩＣカードに記録された登録指紋データ、チップパラメータ、待ち時間を含む個人情報を読み取る
S1
ＩＣカードから読み取ったチップパラメータを半導体容量型センサに設定する
S2
ＩＣカードから読み取った待ち時間をタイマに設定する
S3
N
容量型センサに指が触れたか？
S4
Y
タイマ起動
S5
N
タイマはタイムアップか？
S6
Y
容量型センサを起動
S7
容量型センサにより検出された指紋データを入力
S8
N
全ての指紋データを入力したか？
S9
Y
センサから入力した指紋データとＩＣカードから読み取った指紋データを照合
S10
照合結果ＯＫ
N
S11
Y
本人確認結果出力
S12
終了

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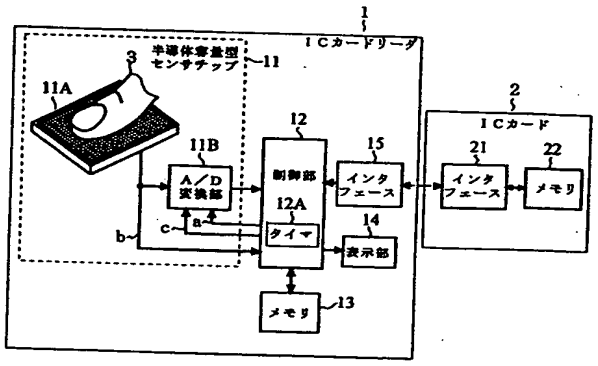
(54)【発明の名称】　指紋照合装置

(57)【要約】
【課題】　乾燥肌や脂性肌等のように個人差を有する人間の指先の指紋画像を検出する場合に的確な検出を行う。
【解決手段】　ＩＣカード２がＩＣカードリーダ１に挿入されると、ＩＣカードリーダはＩＣカードから利用者特有の指紋データ，パラメータ及び待ち時間を読み取り、この利用者特有のパラメータをセンサチップ１１のＡ／Ｄ変換部１１Ｂに設定し、かつ利用者特有の待ち時間をタイマ１２Ａに設定する。利用者の指３がセンサチップに押捺されるとタイマを起動し、タイマのタイムアップ後センサチップを起動して指３の指紋を検出させる。そして、センサチップが検出した指紋データとＩＣカードからの指紋データを照合して利用者本人の認証を行う。



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【特許請求の範囲】
【請求項１】　指紋を検出する半導体からなる容量型センサチップと、
利用者の指紋画像データ及び前記容量型センサチップのパラメータを含む個人情報を保管する保管部と、
前記容量型センサチップにより検出された指紋画像データと前記保管部の指紋データとを照合する指紋照合部と、
前記容量型センサチップに対して前記保管部のパラメータを設定する設定部と、
前記設定部による前記容量型センサチップへのパラメータの設定後、この容量型センサチップを起動し前記指紋画像データを検出させる制御部とを備え、前記指紋照合部は、前記制御部の前記容量型センサチップの起動後にこの容量型センサチップにより検出された指紋画像と前記保管部の指紋データとを照合して指紋認証を行うことを特徴とする指紋照合装置。
【請求項２】　請求項１において、
前記保管部は、前記容量型センサチップの指紋画像検出時の待ち時間を前記個人情報として保管し、
前記容量型センサチップへの指の接触を検出する検出部を備え、
前記制御部は、前記検出部により指の接触が検出された後、前記保管部の待ち時間経過後に前記容量型センサチップを起動し前記指紋画像の検出を開始させることを特徴とする指紋照合装置。
【請求項３】　請求項１または請求項２において、
前記個人情報を保管する前記保管部をＩＣカードに設けるとともに、前記ＩＣカードのデータを読み取るＩＣカードリーダを設け、前記ＩＣカードリーダに前記容量型センサチップ、前記指紋照合部、前記設定部、前記制御部及び検出部を設けることを特徴とする指紋照合装置。
【発明の詳細な説明】
【０００１】
【発明の属する技術分野】本発明は、予め登録された指紋データと半導体容量型センサにより検出された指紋データとの照合を行う指紋照合装置に関する。
【０００２】
【従来の技術】この種の指紋照合装置に用いられる半導体容量型センサは、人間の指紋の凹凸を容量差として検出し濃淡画像として生成するものである。前記指紋照合装置は、指紋を用いて利用者の認証を行う場合、予め利用者の指紋データを登録する。そして、前記半導体容量型センサ上に利用者の指が押捺されると、この利用者の指紋の凹凸を前述のように容量型センサの容量差に基づく指紋画像として検出させるとともに、検出した指紋画像から指紋データを生成して、生成した指紋データと前記登録されている指紋データとを比較し、両者が一致すると利用者本人であると認識するものである。
【０００３】

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【発明が解決しようとする課題】一般に、人間の指先は乾燥肌や脂性肌等のように個人差がある。従来の指紋照合装置は、このような個人差を有する人間の指先の指紋画像を、半導体容量型センサが個人差に無関係に同一条件で検出しているため、照合に必要な的確な指紋画像が得られないという課題があった。したがって、本発明は、乾燥肌や脂性肌等のように個人差を有する人間の指先の指紋画像を検出する場合に的確な検出を行うことを目的とする。
【０００４】
【課題を解決するための手段】このような課題を解決するために本発明は、指紋を検出する半導体からなる容量型センサチップと、利用者の指紋画像データ及び容量型センサチップのパラメータを含む個人情報を保管する保管部と、容量型センサチップにより検出された指紋画像データと保管部の指紋データとを照合する指紋照合部と、容量型センサチップに対して前記保管部のパラメータを設定する設定部と、設定部による容量型センサチップへのパラメータの設定後、この容量型センサチップを起動し指紋画像データを検出させる制御部とを設け、指紋照合部は、制御部の容量型センサチップの起動後にこの容量型センサチップにより検出された指紋画像と保管部の指紋データとを照合して指紋認証を行うようにしたものである。また、保管部は、容量型センサチップの指紋画像検出時の待ち時間を個人情報として保管し、容量型センサチップへの指の接触を検出する検出部を設け、制御部は、検出部により指の接触が検出された後、保管部の待ち時間経過後に容量型センサチップを起動し指紋画像の検出を開始させるものである。また、個人情報を保管する保管部をＩＣカードに設けるとともに、ＩＣカードのデータを読み取るＩＣカードリーダに、容量型センサチップ、指紋照合部、設定部，制御部及び検出部を設けたものである。
【０００５】
【発明の実施の形態】以下、本発明について図面を参照して説明する。図１は本発明に係る指紋照合装置の構成を示すブロック図である。本指紋照合装置は、図１に示すように、ＩＣカードリーダ１と、ＩＣカード２とからなる。ＩＣカードリーダ１は、利用者により押捺された指３の指紋を検出する半導体容量型センサチップ（以下、センサチップ）１１と、センサチップ１１により検出された指紋画像データを入力して所定の処理を行う制御部１２と、制御部１２により入力された指紋画像データを蓄積するメモリ１３と、各種の表示を行う表示部１４と、ＩＣカード２とのインタフェース１５とから構成される。
【０００６】センサチップ１１は、センサ部１１Ａと、センサ部１１により検出された指紋画像をデジタル化して指紋画像データとして制御部１２へ出力するＡ／Ｄ変換部１１Ｂとからなる。また、制御部１２はタイマ１２

Ａを内蔵する。さらに、ＩＣカード２は、ＩＣカードリーダ１とのインタフェース２１と、利用者の指紋画像データを登録するメモリ２２とを有する。

【０００７】ＩＣカードリーダ１を構成するセンサチップ１１のセンサ部１１Ａは、利用者の指３が押捺されると、接触した指３の皮膚の表面の凹凸（即ち、指紋）に応じた容量差を発生し電圧信号として出力するもので、センサ部１１Ａにより出力された電圧信号はＡ／Ｄ変換部１１Ｂにより前述したようにデジタル信号に変換され指紋画像データとして制御部１１に出力される。

【０００８】図２及び図３は前述のセンサチップ１１内のセンサ部１１Ａの構成を示す図である。センサ部１１Ａは、図２に示すように升目状に配置された複数のセンサ４からなり、１つの単位センサであるセンサ４は図３に示すように容量素子である検出素子４１と、信号発生回路４２と、信号増幅回路４３と、出力回路４４とからなる。そして、指３が接触すると、各センサ４の検出素子４１においてはそれぞれ接触した指３の皮膚の表面の凹凸に応じた容量差が発生し、この容量差に応じた電圧信号が信号増幅回路４３により増幅されて出力回路４４からＡ／Ｄ変換部１１Ｂへ出力されるような構成となっている。

【０００９】センサチップ１１を構成するＡ／Ｄ変換部１１Ｂは、センサ４の出力回路４４から出力されるアナログ電圧レベル（アナログ値）をデジタル値に変換するものであるが、設定されるパラメータ値に応じてアナログ値とデジタル値との対応関係が変化する。Ａ／Ｄ変換部１１Ｂに設定されるパラメータは、図４に示すようなパラメータ値Ａ，Ｂが設定される。

【００１０】いま、Ａ／Ｄ変換部１１Ｂに入力されたアナログ値が設定パラメータ値（Ａ＋Ｂ）未満のレベルであればＡ／Ｄ変換部１１Ｂから階調０の真っ黒の指紋画像が得られるものとする。また、Ａ／Ｄ変換部１１Ｂに入力されたアナログ値が設定パラメータ値（Ａ＋（２５５×Ｂ））以上であればＡ／Ｄ変換部１１Ｂから階調２５５の真っ白の指紋画像が得られるものとする。さらに、Ａ／Ｄ変換部１１Ｂに入力されたアナログ値がパラメータ値（Ａ＋ｎ×Ｂ）以上でかつパラメータ値（Ａ＋（ｎ＋１）Ｂ）未満のレベルであればＡ／Ｄ変換部１１Ｂから階調ｎの指紋画像が得られるものとする。

【００１１】このように、パラメータ値Ａを大に設定するとＡ／Ｄ変換部１１Ｂから得られる指紋画像は黒くなり、パラメータ値Ａを小に設定するとＡ／Ｄ変換部１１Ｂから得られる指紋画像は白くなる。また、パラメータ値Ｂを大に設定するとＡ／Ｄ変換部１１Ｂから得られる指紋画像の分解能は粗くなり、パラメータ値Ｂを小に設定するとＡ／Ｄ変換部１１Ｂから得られる指紋画像の分解能は細かくなる。このようにしてＡ／Ｄ変換部１１Ｂのパラメータ値を変えることによりＡ／Ｄ変換部１１Ｂから得られる指紋画像の輝度や分解能を変えることができる。したがって、乾燥肌や脂性肌等のように個人差を有する人間の指先の指紋画像を検出する場合に、こうした個人差に応じたパラメータ値をＡ／Ｄ変換部１１Ｂに設定することにより、Ａ／Ｄ変換部１１Ｂから前記のような個人差に影響されない的確な指紋画像を出力させることができる。

【００１２】図５は本指紋照合装置の要部動作を示すフローチャートであり、センサチップ１１による指紋の読み取り動作を示すものである。このフローチャートにしたがい本発明の要部動作を詳細に説明する。ところで、ＩＣカード２のメモリ２２には、利用者固有の指紋画像データが登録されているとともに、前述したセンサチップ１１内のＡ／Ｄ変換部１１Ｂに設定されるこの利用者固有のパラメータ値Ａ，Ｂ、及びＡ／Ｄ変換部１１Ｂが変換動作を開始するまでの待ち時間が利用者の個人情報として登録保管されている。

【００１３】こうしたＩＣカード２が利用者によりＩＣカードリーダ１に挿入されると、ＩＣカードリーダ１の制御部１２はまずステップＳ１において、ＩＣカード２のメモリ２２から利用者の指紋画像データ，パラメータ値及び待ち時間を読み取ってメモリ１３に記憶する。次に、制御部１２はステップＳ２でこのパラメータ値を図１に示す信号線ａを介してＡ／Ｄ変換部１１Ｂに設定するとともに、前記待ち時間をステップＳ３でタイマ１２Ａに設定する。

【００１４】次に制御部１２は、ステップＳ４で利用者の指３がセンサチップ１１内のセンサ部１１Ａに押捺されたか否かを図１に示す信号線ｂを介して検出判断し、指３の押捺を検出すると、ステップＳ５でタイマ１２Ａを起動する。そして、ステップＳ６でタイマ１２Ａのタイムアップの有無を判断し、タイマ１２ＡがタイムアップするとステップＳ７でＡ／Ｄ変換部１１Ｂを図１に示す信号線ｃを介して起動する。

【００１５】その後、制御部１１は、センサ部１１Ａにより検出されＡ／Ｄ変換部１１Ｂによりデジタル化された指紋画像データをステップＳ８で順次読み取ってメモリ１３に順次記憶し、全ての指紋画像データの読み取りが終了してステップＳ９の判定が「Ｙ」となると、センサチップ１１から読み取りメモリ１３に記憶した指紋画像データと、ＩＣカード２のメモリ２２から読み取りメモリ１３に記憶した指紋画像データとの照合処理をステップＳ１０で行う。

【００１６】そして、前記照合処理の結果についての良否判断をステップＳ１１で行い、センサチップ１１から読み取った指紋画像データとＩＣカード２から読み取った指紋画像データが一致しステップＳ１１の判定が「Ｙ」となると、ステップＳ１２で表示部１４に「本人認証」旨の本人確認結果出力を行い表示する。

【００１７】このように、乾燥肌や脂性肌等、個人差を有する人間の指先の指紋画像を検出する場合に、こうし

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た個人差に応じたパラメータ値をＡ／Ｄ変換部１１Ｂに設定するように構成したことにより、前記のような個人差に影響されない、正確な指紋画像をＡ／Ｄ変換部１１Ｂから出力させることができる。さらに、個人差を有する人間の指先の指紋画像を検出する際には、前記のような個人差に応じてセンサチップ１１の検出待ち時間を設定するようにしたことにより、前記のような個人差に影響されない、より正確な指紋画像を得ることができる。

【００１８】

【発明の効果】以上説明したように本発明によれば、指紋を検出する半導体からなる容量型センサチップと、利用者の指紋画像データ及び容量型センサチップのパラメータを含む個人情報を保管する保管部と、容量型センサチップにより検出された指紋画像データと保管部の指紋データとを照合する指紋照合部と、容量型センサチップに対して保管部のパラメータを設定する設定部とを設け、設定部による容量型センサチップへのパラメータの設定後、この容量型センサチップを起動し指紋画像データを検出させるようにしたので、乾燥肌や脂性肌等、各個人毎に差がある人間の指先の指紋画像を検出する場合に、こうした個人差に応じたパラメータが容量型センサチップに設定されることから、容量型センサチップからは前記のような個人差に影響されない、的確な指紋画像を出力させることが可能になる。また、保管部は、容量型センサチップの指紋画像検出時の待ち時間を個人情報として保管するとともに、容量型センサチップへの指の接触を検出する検出部を設け、検出部により指の接触が検出された後、保管部の待ち時間経過後に容量型センサチップを起動し指紋画像の検出を開始させるようにした

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ので、個人差を有する人間の指先の指紋画像を検出する際には前記のような個人差に応じて容量型センサチップの検出待ち時間が設定されることから、容量型センサチップからはこうした個人差に影響されない、より正確な指紋画像を出力させることが可能になる。また、個人情報を保管する保管部をＩＣカードに設けるとともに、ＩＣカードのデータを読み取るＩＣカードリーダに、容量型センサチップ、指紋照合部、設定部，制御部及び検出部を設けるようにしたので、各利用者は自身の個人情報を的確に管理保管できる。

【図面の簡単な説明】

【図１】　本発明に係る指紋照合装置の構成を示すブロック図である。

【図２】　前記指紋照合装置の半導体容量型センサチップ内の指紋センサ部の構成を示す図である。

【図３】　前記半導体容量型センサチップ内の１つの検出単位の構成を示すブロック図である。

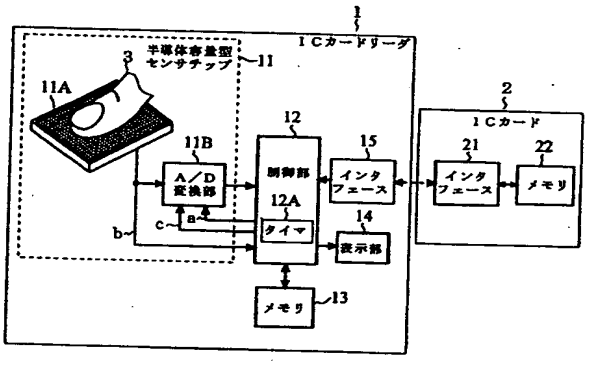
【図４】　前記半導体容量型センサチップ内のＡ／Ｄ変換部に設定されるパラメータの状況を示す図である。

【図５】　指紋照合装置の要部動作を示すフローチャートである。

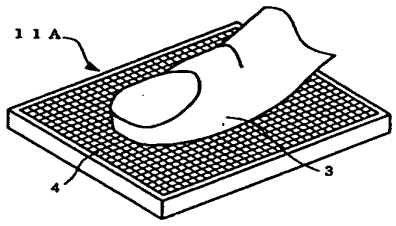
【符号の説明】

１…ＩＣカードリーダ、２…ＩＣカード、３…指、４…センサ、１１…半導体容量型センサ、１１Ａ…センサ部、１１Ｂ…Ａ／Ｄ変換部、１２…制御部、１２Ａ…タイマ、１３，２２…メモリ、１４…表示部、１５，２１…インタフェース、４１…検出素子、４２…信号発生回路、４３…信号増幅回路、４４…出力回路。

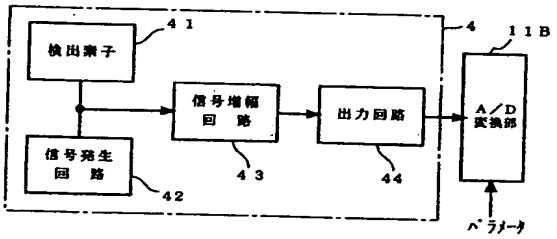
【図１】



【図２】



【図３】



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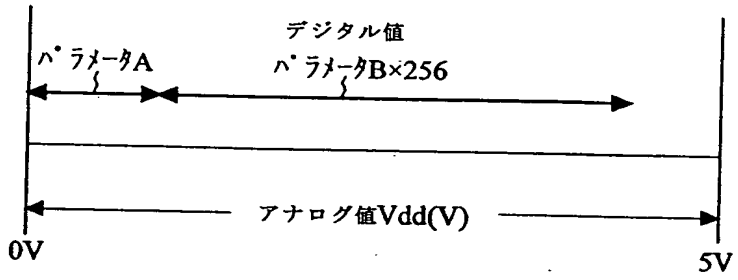

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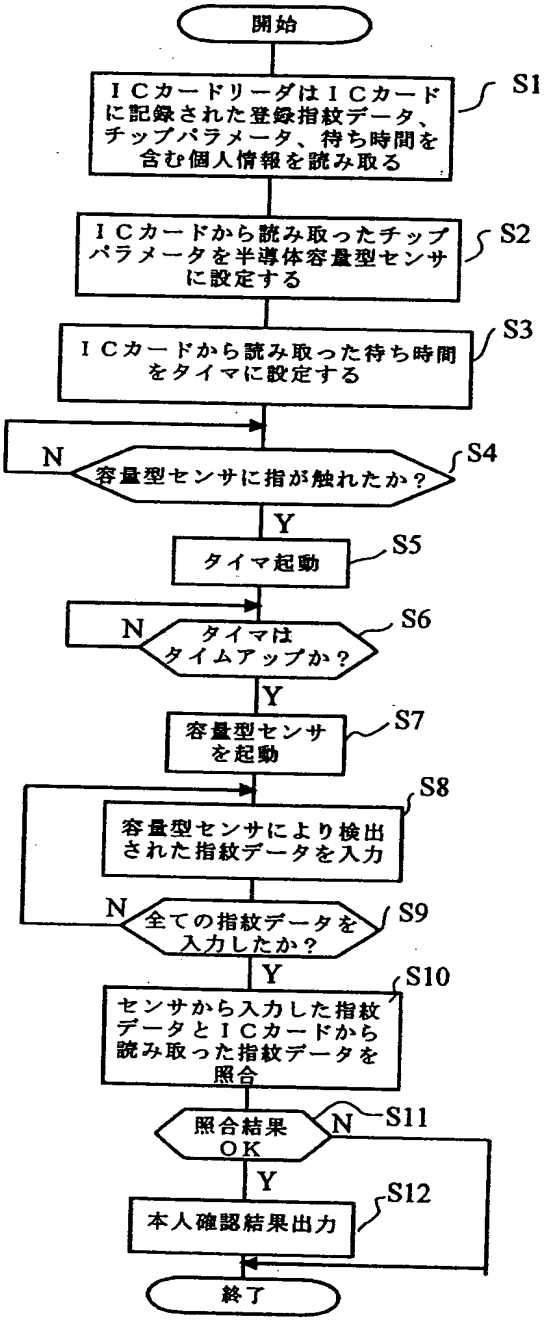

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